THE DISPATCH

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This Issue

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From the Program Manager

By this point, hopefully most of our STARS users have been able to use, evaluate, and provide feedback on the NextGen STARS-U that came online in December of last year. We believe it's a vastly superior tool for our online customer than was our legacy STARS system. NextGen STARS-C is currently scheduled to go live in the coming weeks.

As stated last quarter, as part of our agile development process there are ample opportunities to participate in the system evolution, and we encourage our users to take advantage of the new online Feedback and Report a Problem forms to help us improve your system.

This issue of the DTRIAC Dispatch focuses on *Effects Manual One* or EM-1, and I hope it is of interest and of value to you. This issue will also be my last as the DTRIAC PM as I will soon depart DTRA. It has been my privilege to work to increase the awareness of our organization among the broader Combatting WMD customer base, make DTRIAC information more discoverable and easier to access, and also work alongside some great men and women that strive hard each day to make the DTRIAC the best organization that it could possibly be.

Please contact us directly if you ever have any questions or comments related to the DTRIAC at dtriac@dtra.mil.

Thanks,
Lt Col Craig Hess
DTRIAC Program Manager

DTRA's Effects Manual One (EM-1)

DTRA's *Capabilities of Nuclear Weapons: Effects Manual One* (EM-1) is an authoritative source reference document on nuclear weapons phenomenology and effects that is available to all branches of the United States government. It documents a field that is constantly changing and is driven by world politics, national priorities and politics, budgetary constraints, evolving threats, and nuclear proliferation. It summarizes the current knowledge of the phenomena, the subsequent direct and indirect effects on targets of military and civilian interest, and collateral effects on others. The technical content of EM-1 is designed to satisfy the needs of the engineer, scientist, operational planner, and administrator who require summarized data, analytical tools, and guidance for making approximate calculations and analyses of nuclear weapon effects. Sufficient background and tutorial material is included to rationalize the guidance for the proper use of the data and analytic methodologies furnished. The document also serves as the main source of material used for the preparation of operational and employment manuals by the military services.

DTRA's Effects Manual One (EM-1) *(continued)*

The original predecessor document was an unclassified U.S. government publication entitled *Effects of Atomic Weapons*, prepared by the Los Alamos Scientific Laboratory and made available to the public around 1950. It described phenomena and effects of nuclear weapons that were known at that time.

In 1951 the Armed Forces Special Weapons Project, a predecessor agency of the several incarnations of DTRA, prepared a companion publication, *Capabilities of Atomic Weapons,* which also covered the entire spectrum of weapon phenomena and effects, but was classified Confidential and contained more information specifically for use by DoD agencies.

Capabilities differed from *Effects* in two important respects. First, it provided more detailed information than *Effects*. Second, it was published as a triservice document, bearing different Army, Navy, and Air Force identifying numbers. Because triservice preparation and publication was unwieldy, the editorial and publication responsibilities were assigned to the Defense Atomic Support Agency, successor to the Armed Forces Special Weapons Project and a forerunner to DTRA. Renamed *Effects Manual One* (EM-1), the document's security classification was upgraded to Secret-Restricted Data and the scope and level of detail were increased. Furthermore, additional phenomena (e.g., x-rays, gamma rays, and neutrons) were included, and previous discussions of other phenomena (e.g., electromagnetic pulse and damage to various military systems) were expanded upon.

Over the years the contents of EM-1 have undergone many revisions within the limits of available funding. Choices often have to be made between conducting and reporting on critically required research or updating a state-of-the-art summary. Currently, rather than waiting to periodically revise and update the entire document, the effort is to constantly rewrite those individual chapters that appear to be the most deficient in terms of evolving threats or new blue or red weapon technologies. The protocol problem is addressed by constantly studying defense policy and guidance and querying the uniformed services on their information needs were expanded of other phenomena, such as electromagnetic pulse, and damage to various military systems.

The organization of EM-1 maintains the loose-leaf concept in that, rather than waiting for the completion of all EM-1 chapters, each is published separately and placed on a compact disc when completed to facilitate early use of the revised material. This format also facilitates future revisions. The EM-1 chapter numbers, titles, and publication dates are listed in table on next page.

The chapters dealing with the environments from nuclear weapon bursts appear first, followed by the chapters dealing primarily with the effects of nuclear environments upon military targets. Continuous reviews, updates, and revisions of the EM-1 material are planned. Thus, dating each entry and identifying all sources of the data included is emphasized.

Throughout the various chapters of EM-1, there are many cited references to the publications from which the data and analyses were taken. If more detailed information is required, the reader may review the cited reference documents that are available through DTRIAC on presentation of the appropriate credentials. The archives within DTRIAC, including its electronic literature database called STARS, contain the invaluable data and reports of the nuclear weapons effects experiments performed in the 47 years of atmospheric and underground nuclear testing. Much of this literature contains the only data available for the validation of calculations on the environments and their effects.

EM-1 Chapter Titles and Publication Dates

Chapter	Title	Date	Comment
1	Introduction and Guide	2011	ongoing
2	Airblast Phenomena		
	Section 2I Ideal Airblast	Sep 85	
	Section 2II Airblast Over Real (Non-Ideal) Surfaces	Feb 92	
3	Cratering, Ejecta, and Ground Shock	Dec 91	under revision
4	Nuclear Particulate Clouds	Oct 92	
5	Underwater Explosions	Sep 91	under revision
6	Thermal Radiation	May 85	
7	X-Ray Radiation		
	Section 7I X-Ray Phenomena	Mar 87	
	Section 7II X-Ray Interactions and Response	Feb 93	
	Section 7III X-Ray AGT/UGT Testing and Simulation	Feb 93	
8	Nuclear Radiation Phenomena	Mar 90	
9	Phenomena Affecting Electromagnetic Wave Propagation	Apr 86	under revision
10	Electromagnetic Pulse (EMP)	Sep 92	under revision
11	Transient Radiation Effects on Electronics (TREE) Phenomenology	Jul 88	
12	Electromagnetic Wave Degradation	May 90	under revision
13	Optical Systems Degradation	Jul 90	
14	Effects on Personnel	Mar 93	
15	Damage to Structures	Apr 93	under revision
16	Fires from Nuclear Weapons	Nov 92	
17	Damage to Military Field Equipment	Apr 92	
18	Airblast Damage to Forests	Aug 93	under revision
	Damage to Ships and Submarines	Jun 87	under revision
20	Damage to Aircraft	Mar 94	
21	Damage to Missiles	May 93	under revision
22	Damage to Space Systems	Nov 92	

Chemical & Biological Effects Manual (CB-1)

As director of the Chemical and Biological Technologies Directorate, Dr. Alan S. Rudolph stated in 2012, "It is imperative that we create an ecosystem of knowledge creation and translation that moves with agility to respond dynamically to the challenge presented by chemical and biological threats."

The CBDP provides essential integrated, coordinated, and sustainable chemical, biological, radiological, and nuclear (CBRN) materiel and nonmateriel solutions to the warfighter. It is imperative that the CBDP quickly transform and transition these technologies into warfighting capabilities. The CBDP Research, Development, Test and Evaluation (RDT&E) community is critically dependent upon data and metadata which contributes to the knowledge base upon which new, innovative, and improved methodologies and capabilities are developed. Data and analytical methodologies from a broad range of multidisciplinary physical and medical science and technology (S&T) are required for basic and applied research and advanced technology development to meet technology needs and address capability gaps. The absence of or lack of access to well-qualified data, models, or approved analytical methods represents a significant risk to the development and acquisition of key systems and capabilities and inhibits the CBDP from responding with speed and agility. This problem is magnified as the CBRN threat continues to evolve. The RDT&E community must have a greater shared understanding of the underlying data and supporting methodologies in order to identify the gaps and shortcomings.

Chemical & Biological Effects Manual (CB-1) *(continued)*

Decades of investment in CB defense resulted in a large volume of data and methods for deriving a fundamental understanding of the CBRN threat and its impact on operations. Multiple funding organizations, sponsoring agencies, and performers led to a multiplicity of diverse efforts and corresponding data.

During fiscal year (FY) 2010 alone, the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) provided 2,507,796 individual pieces of CBD equipment, vaccine doses, assays, and reagents across the Services, according to the Department of Defense Chemical and Biological Defense Program Annual Report to Congress. Data and analytical methods used in the development of these products and capabilities exist at all of the participating CBD S&T and RDT&E organizations in various forms. This data, along with other ongoing CBR testing, is relevant not only to the specific application but, with proper positioning and metadata, can inform other S&T needs and investments.

DoD planning includes radiological and nuclear defense along with CB defense in its planning activities. Radiological and nuclear defense capabilities within the CBDP are limited to certain types of radiation detection equipment, modeling and simulation capabilities, and medical research on radioprotectants. Various other radiological and nuclear defense efforts, including systems for nuclear and radiation hardening, nuclear detection, medical radiological defense, and other selected programs are outside the scope of the CBDP.

An enduring challenge for the CBD community is how to preserve and manage data, to understand its ongoing relevance, and to rapidly translate this data into useful information and knowledge. Today, only a small subset of the collective information is available via the community's repositories in the form of technical reports and databases. The information analysis centers (IACs) (e.g., DTIC, CBRNIAC, and DTRIAC) provide access to many reports and papers, primarily as scanned images, submitted as deliverables to DoD organizations. Many databases or repositories containing data on focused topics or tests have been constructed by DoD organizations and their contractors and are independently maintained by those organizations. The result is a series of discrete, stove-piped resources not subject to federated search and distributed access.

Examples include the Chemical Biological Material Effects Database (CB/ME) at Army Research Laboratory (ARL) and test information sources on the VISION Digital Library System (VDLS) at the US Army Dugway Proving Ground (DPG). These systems contain invaluable data for RDT&E but typically require separate access mechanisms and have varied architectures, search engines, and capabilities. Additionally, there is no existing capability for preserving the collective analytical methods of CB-defense analysis or the pedigree of the associated datasets. The absence of this context in describing the data and its generation not only inhibits its use but raises the risk of misapplication or misunderstanding of the data. Consequently, without a vetted process and a single authoritative source, there is no reliable mechanism for capturing and leveraging the wealth of existing information, generating a baseline understanding of CBRN warfare effects, and providing access to original data and methodologies.

In FY 2008-2009, the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD), Defense Threat Reduction Agency (DTRA), initiated the CBRN Data Backbone program to address this need. They were directed to develop a process to produce and maintain the single, authoritative data source for chemical and biological agent phenomenology, effects, detection, defense, and defeat for use across the breadth of the community of interest (COI).

This work focused on understanding the available data and the issues associated with providing a federated data management approach to enable COI access to disparate data systems. An explicit product of this effort was the selective harvesting of metadata records from various externally-held resources and the development of an overarching ontology, with the goal of promoting a shared vocabulary to facilitate reuse of data beyond its original intent by allowing federated search and retrieval.

Chemical & Biological Effects Manual (CB-1) *(continued)*

FY 2010-2011 investments leveraged the mapping of the CB defense knowledge base and sought to distill the disparate data sources into authoritative information summarizing key phenomenology. The community recognized the need to gain consensus across the data to accurately capture CBRN phenomenology and effects with sufficient context to allow for reapplication of the data and methods to new capabilities. By aggregating data and documentation into a single, comprehensive source, it provides an opportunity for the CB defense community to validate and accredit the methods and data. The aggregation of this information achieves two of the JSTO-CBD guiding principles: (1) describe current state based on data, beliefs, and assumptions and (2) identify well-defined shortfalls and required changes.

The JPEO-CBD, Joint Requirements Office (JRO), Department under the Secretary of the Army Test and Evaluation (DUSA-TE), and components within US Army Edgewood Chemical Biological Center (ECBC) and DPG also acknowledged the need for the development of an authoritative source for knowledge about the CBRN threat. As a result, in December of 2011, the CB-1 Test and Evaluation Capabilities Needs (TECN) was endorsed as a DoD T&E standard by the Test and Evaluation Capabilities and Methodologies Integrated Process Team (TECMIPT).

The blueprint for CB-1 is DTRA's *Effects Manual One* (EM-1), *Capabilities of Nuclear Weapons,* created in 1957 for the nuclear and radiological community. CB-1 seeks to emulate EM-1's mandate "to promulgate to the military services (and their contractors) an official authoritative DNA [Defense Nuclear Agency—now DTRA] position on nuclear weapons phenomena and their effects on military systems" for CB defense.

The FY 2008-2009 CBRN Data Backbone/CB-1 efforts identified, established, and characterized the current CBRN knowledge base (data sets and assets [e.g., people, organizations, and infrastructure] across the CBD community). A bottom-up analysis of the drivers (products & requirements), enablers (supporting sciences, modeling and simulation tools, T&E, and basic science), and facilitators (informatics & infrastructure) was performed using inputs from the existing repositories, online resources and knowledge centers, presentation material, and one-on-one interviews with key community stakeholders. The effort yielded a fundamental taxonomy for managing data and metadata, and knowledge discovery. This definition provides the basis for generating the outline and chapters as shown in Figure 1.

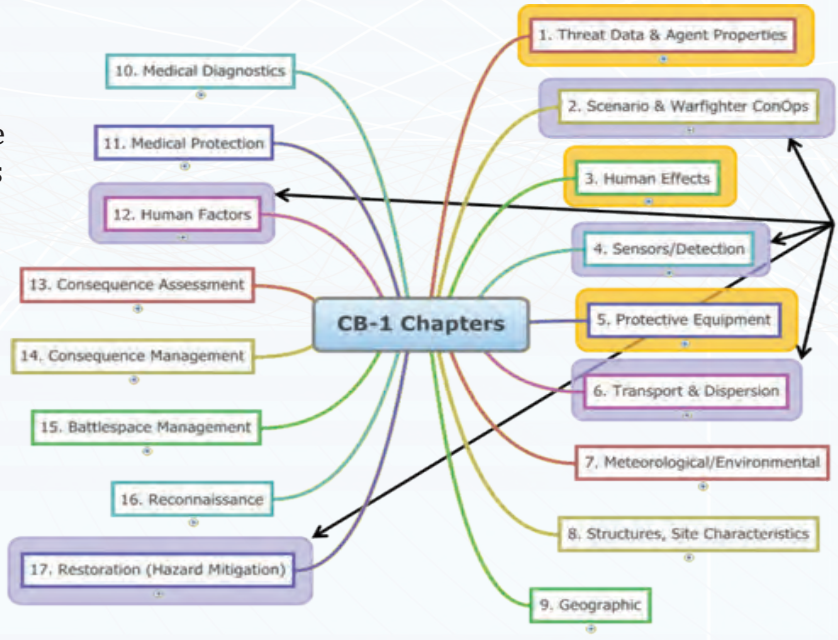


Figure 1: CB-1 Chapter Structure

Per CB-1 TECN, CB-1's role is not only to assemble a central repository for useful data and information across the CBDP, but also to inhibit misuse, duplication of effort, and ultimately reduce costs. The first priority is to develop authoritative chapters based on immediate needs by synthesizing the identified information into an authoritative source. The next step is to extend this outline to become the foundation for a larger portal to, and repository for, relevant CBRN data sets and assets. Figure 2 illustrates how CB-1 can provide visibility to relevant methods and data in both written and web-based forms. As such, all standardized modeling and analytical practices will be documented in CB-1 and the portal will act as a single reference for locating datasets and methods relevant to such analysis. The CB-1 taxonomy allows for an efficient and powerful method for assigning metadata attributes to both.

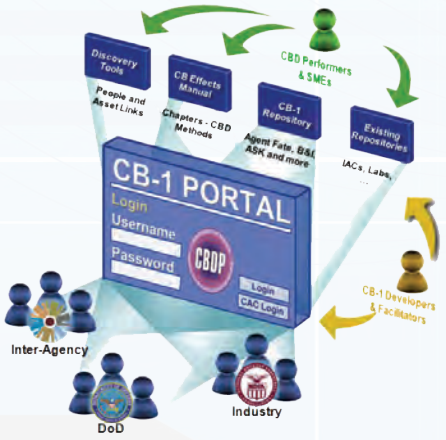


Figure 2: CB-1 Portal

Positioning the DTRIAC Collection for Tomorrow's Challenges

The DTRIAC is among the largest IACs in the DOD and operates in accordance with DOD Instruction 3200.14 in order to establish and maintain a comprehensive knowledge base for DTRA. The current collection consists of a classified and unclassified set of over 230,000 documents, 10 million linear feet of film, and two million photos reflecting the work of DTRA and its legacy organizations, Defense Atomic Support Agency, Defense Nuclear Agency, and the Defense Special Weapons Agency. The nature of the collection expanded with the evolution of DTRA but the mission remains the same—to provide a knowledge-based environment to decision makers.

The challenge for DTRIAC is how to best position its diverse set of scientific and technical data for an even more diverse and dynamic user community. The answer lies in the ability to identify and deliver information of value by building tailored, open architecture, and secure information integration and in sharing enterprise solutions to benefit the entire CWMD community. The development and fielding of the NextGen STARS information management system provides a set of open source technologies built to community standards to facilitate data discovery and access. The new technology allows full-index word search across the DTRIAC collection, providing the user with both basic and advanced search capability. This "Google- like" interface supports user self-directed interactions with the data and is ideal when the user knows what they are looking for in the system. The addition of highlighted search words in the search return list and the inclusion of snippets detailing the occurrence of the search words in the text all facilitate a user's ability to find the known knowns.

The NextGen STARS also supports browse capability built around metadata and keywords. The ability to designate facets or key concepts, such as data type or author, gives the user the ability to learn about a designated area. The expert scaffolding provided around a topic area by the DTRIAC information specialist and data providers enables users to systematically investigate the collection for relevant information on a given topic and find the known unknowns.

Key to the browse functionality is the development of domain representations of the collection that allow DTRIAC to describe its contents in terms that support crosscutting searches by multiple domain specialties. As DTRIAC's mission, content, and user communities have grown to deal with the entire DTRA mission space, it has become necessary to find ontology to formally represent knowledge as a set of concepts appropriate for all users. In the past, DTRIAC maintained a perspective-specific representation of its domain, focused on its nuclear mission and organized around Cold War applications. The drawback to the imposition of a specialized structure and set of metadata is that it is over-optimized to a single specialty or perspective and does not support crosscutting searches. This is insufficient in today's security environment where the threat is complex and dynamic and the solutions must draw across multiple disciplines, user groups, and data sets.

To facilitate the widest access and increased usability, DTRIAC is working to create a perspective-neutral representation of the data to accommodate multiple perspectives and vocabularies for describing a domain. This effort requires describing the reality of the collection in terms of its underlying phenomenology. This first-order organization provides a description of the collection as it exists and supports further structuring regarding its potential implications and the format of the data elements.

This approach allows DTRIAC to represent its collection not as a series of test shots or record types but as underlying phenomenology. From this perspective, users do not need to know the history and objective of the United States nuclear testing program to find data representing a discrete set of phenomenology. Instead, the development of an ontology based on nuclear weapons effects allows users to search across multiple tests, records, reports, and data types to find information on phenomenology such as ground shock. The organization of the collection along these generic lines ensures greater reuse of data and further positions the collection for data analytics and visualization using software modules capable of plugging into the STARS architecture. When complete, the process of organizing the data and the application of data analytics will support the discovery of the unknown unknowns and with it the ability to make connections that were previously not available or understood.

The Future of EM-1

DTRA's *Effects Manual One: Capabilities of Nuclear Weapons*, better known as EM-1, is undergoing a multiyear effort to update all 22 chapters. The update is planned to not only be a revision but also be a revitalization of EM-1. The EM-1 update project's purpose is to create and execute a systematic methodology to organize, develop, review, and publish state-of-the-art chapters. Additionally, chapter documents and their derivative tools will better meet current user needs and technology requirements.

Currently, 9 of the 22 chapters have begun the update process. The first chapter to be completed is the Electromagnetic Pulse chapter, and it should be through DTRA's security review and ready for distribution by the end of April. Other chapters will follow at a rate of three per year.

Through the years EM-1 has matured and grown from a single volume, to 2 volumes, to 22 volumes, to 22 compact disks with hyperlinked pdf files. When this EM-1 update is completed, the entire set will become an online wiki. Why a wiki? For several reasons:

- **Hyperlinks.** Key structures, terms, and concepts n EM-1 will be connected to related content elsewhere in the document. Readers can simply click on a hyperlink to discover other information related to what they are currently researching. Additionally, hyperlinks can be created to conveniently direct users to cited reference materials.
- **Accessibility.** Since EM-1 would be published electronically, anyone with access to the Secure Internet Protocol Router Network (SIPRNet), an account on DTRA STARS, and appropriate clearance and need-to-know caveats will be able to read EM-1. An unclassified limited-access version will also be available on the internet through DTRA STARS, replacing the EM-1 Handbook. Distribution of EM-1 to new users will be as simple as creating a STARS account.
- **Accountable Editing.** Authorized users may make edits to the content and their updates are applied instantly; there will be no need to wait for the next time DTRA funds an EM 1 update. This method will facilitate EM-1's currency. Additionally, wiki technology includes built-in version control that allows the return to a previous revision when necessary.
- **Searchable.** The EM-1 Wiki will offer search capabilities comparable to today's search websites.

In conclusion, the EM-1 update project combines the breadth and importance of a current EM-1 with advances in information sharing technology to make EM-1 available to the entire nuclear weapons effects community in a concise, easy-to-use, easily maintained form.

Defense Threat Reduction Information Analysis Center

Nuclear explosion environments and the related effects correlated to EM-1 chapters.

System-Generated EMP
(7, 10, 11, 21, 22)

Radiation Effects on Electronics
(7, 8, 11, 17, 19, 20, 21, 22)

Red-Out
(8, 21, 22)

Electron-Caused EMP
(7, 22)

Electrons
(4, 8, 22)

X-Rays
(7, 8)

Global Information Grid
(4, 8, 9, 10, 12, 13, 17, 19, 20, 22)

Intelligence, Surveillance, and Reconnaissance (ISR)
(7, 9, 10, 13, 22)

γ-Rays
(4, 8, 10)

Satellite Communications and Global Positioning System (GPS)
(7, 9, 10, 11, 12, 13, 22)

Single Event Upset
(7, 8, 11, 17, 20, 21, 22)

Total Dose
(4, 7, 8, 11, 14)

Thermomechanical Structural Effects
(7, 8, 13, 15, 21, 22)

Neutrons
(4, 8)

Signal Propagation through Disturbed Atmospheres
(9, 12)

Re-Entry Vehicles (RVs) and Re-Entry Bodies (RBs)
(7, 8, 11, 21)

Collateral Effects
(2, 3, 4, 6, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18)

Electromagnetic Pulse (EMP)
(10, 20, 21, 22)

Missile Defense
(7, 8, 9, 10, 11, 12, 13, 19, 20, 21, 22)

Strategic Systems
(7, 8, 9, 10, 11, 21, 22)

Underwater Explosions
(5, 19)

Airblast, Cratering, and Ground Shock
(2, 3)

Submarines
(2, 3, 5, 8, 11, 12, 14, 15, 19)

Ships
(2, 4, 5, 6, 8, 10, 11, 12, 13, 14, 15, 19)

Field Equipment and Vehicles
(2, 3, 4, 6, 11, 14, 16, 17, 18)

Infrastructure
(2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 22)

Fallout
(4, 8)

Aircraft
(2, 4, 6, 8, 9, 10, 11, 12, 13, 14, 20)

Personnel
(14)

Thermal Radiation and Fires
(6, 16)

Consequence Management
(2, 3, 4, 6, 8, 10, 11, 14, 15, 16, 18)

DTRIAC Collection Additions

DTRA Technical Reports

DTRA-TR-12-10, Candidate Sporicide-Generating Concepts for Next-Generation Agent Defeat Payloads
This report documents an investigation into potential sporicide-generating concepts for next-generation agent defeat payloads. Attendees at the Prompt Thermal WMD Payload Workshop in August 2009 concluded that improvements to current Agent Defeat approaches could be best achieved by combining new payload concepts with advanced payload and case designs. Previous tests have shown that payload concepts that exploit thermally enhanced chemical neutralization of biological agents offer considerable promise for the next-generation Agent Defeat weapon. This report details the evidence supporting the effectiveness of sporicides at elevated temperatures and discusses candidate compounds that have the potential for generating high concentrations of sporicides and elevated temperatures.

DTRA-TR-12-32, Summary of Consequence Assessment Experiments Conducted During Fiscal Years 2008 and 2009
This report summarizes the data obtained during several experimental programs conducted under the sponsorship of the DTRA and the U.S. Army Engineer Research and Development Center. These programs were performed primarily to provide grafility data to support DTRA weapons effects prediction tools, to understand the response of chemical simulant containers to fragment impacts, and to investigate the visibility through post-strike dust clouds. The experiments were conducted or first reported during U.S. government fiscal years 2008 and 2009. This report summarizes and analyzes the results of 81 tests.

DTRA-TR-12-40, High Intensity Superconducting Cyclotron
This report documents the results of an effort to design, fabricate, and test a prototype compact superconducting proton cyclotron, which could be used in the field for sensing fissile materials at long-range. Initiated in August 2010, this work was undertaken by the Massachusetts Institute of Technology under contract with Pennsylvania State University/Applied Research Laboratory with funding from the Defense Threat Reduction Agency. The cyclotron was to achieve a final energy of 250 MeV and a final beam intensity of 1 mA with less than 0.1% extraction loss. This report describes the accomplishments and status of work on the five major subsystems of the project: (1) proton injection using external electron cyclotron resonance source with axial injection using spiral inflector, (2) magnetic field design, (3) radio frequency accelerating cavities, (4) cryogenic system, and (5) beam extraction. In March 2012, DTRA suspended work on the project indefinitely.

DTRA-TR-12-44, System Nuclear Vulnerability Assessment Module (SAM)
The DTRA System Nuclear Vulnerability Assessment Module (SAM) project provides specialized high-altitude radiation phenomenology applications to DTRA and its customers. The SAM program is responsible for legacy high-altitude nuclear effects codes, many of which are found in Advanced System Survivability Integrated Simulation Toolkit. Breaking from past precedent of desktop software installation, these applications are hosted via web services or within Integrated Weapons of Mass Destruction Toolset. SAM prepares legacy HANE capabilities for integration in DTRA's Nuclear Capability Services, which is embedded in IWMDT. SAM also enhances legacy HANE models with modern algorithms and user capabilities to support modern HARP applications. SAM develops applications compliant with DoD Architectural Framework standards.

DTRA-TR-12-48, Comparison of Radiation Dose Studies of the 2011 Fukushima Nuclear Accident Prepared by the World Health Organization and the U.S. Department of Defense
The earthquake and the tsunami that occurred in Japan on March 11, 2011, led to the release into the environment of radioactive materials from the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station. This report compares the data, assumptions, exposure pathways, and estimation methods used in the two radiation dose assessments prepared by the World Health Organization and the United States Department of Defense. The range of doses estimated by the two groups were compared and found to be generally in agreement at the locations covered by both studies.

DTRIAC Collection Additions *(continued)*

DTRA-TR-12-49, Vessel Boarding Inspection System (VBIS) 2.1 Spiral 2: DTRA USNS Wright (T-AVB 3) 2012 Measurement Campaign Report

The Vessel Boarding Inspection System (VBIS) program seeks to develop and integrate a suite of systems that provide a boarding team with an enabling toolkit for Maritime Interdiction Operations (MIO). The MIO mission is to detect, locate, and identify radiological/nuclear threats aboard maritime vessels in both compliant and non-compliant boarding scenarios. The weakest link in the MIO mission has historically been the voice and data communication system, due to the extremely challenging, multi-path environment aboard a container vessel. In addition to choosing a communication system that addresses that problem, the VBIS platform aims to enhance the MIO mission by integrating detection systems and tactical command and control software. This enables the boarding officer located at a control point on the vessel of interest to maintain real-time, local situational awareness of the sensor feeds and Blue Force tracks with the VBIS Command, Control, and Communications collaborative suite. This document is a description of the Defense Threat Reduction Agency VBIS 2.1 Spiral 2 measurement campaign at the Port of Baltimore. The Spiral 2 evolution builds upon the work accomplished under Spiral 1 by comparing the performance of the newly-developed TW-230 (Cheetah Net II) radio with that of the TW-220 (CheetahNet) from TrellisWare Technologies and integrating the Zephyr BioHarness physiological monitor and The Johns Hopkins University Applied Physics Laboratory Radiation Mapper codebase into the Mobile Field Kit-Radiation common operating picture software. Experimental results with a prototype, LIDAR-based enhanced mapping and positioning system for hands-free map generation and blue force tracking are also presented.

DTRA-TR-12-50, Engineering Methodology Report BICADS Vulnerability Assessment and Protection Option Version 4.0

The Building Injury Calculator And DatabaseS component provides an engineering methodology for the prediction of human injury inside buildings. This component integrates external code from Baker Engineering and Risk Consultants (BakerRisk) to perform the injury calculations. BICADS leverages decades of empirical data and analytic simulations to correlate human injury with structural damage, glazing damage, and interior component debris.

DTRA-TR-12-51, Engineering Methodology Report, Blunt Trauma Human Injury Model, Vulnerability Assessment and Protection Option Version 4.0

This report documents the development of models to predict human injuries due to blunt trauma caused by impact of blast-generated glazing debris. The models are based on previously performed calculations using biomechanical models as well as on test data from instrumented full-scale experiments.

DTRA-TR-12-63, Collaborative Research: Catalog Completeness and Accuracy

Data has been assembled from a number of portable seismic experiments mounted in the last few years driven largely by an interest in the structure and dynamics of the India-Asia collision. Data has been used collected in these experiments, as well as broad band data collected on a number of national and private networks, along with global seismic stations to produce a high quality regional catalogue with a detection threshold less than magnitude 3 for most of the middle east and central Asia. A new grid-based implementation has been developed of the progress multiple event location. A second parallel effort is to apply waveform correlation methods to the entire dataset. Waveform correlation can dramatically improve measurement precision, but it can only be done successfully when waveforms are similar enough to allow correlation.

DTRA-TR-12-74, Accelerated Decay of Radioisotopes

Radioisotopes have energy densities up to 1e9 J/g, whereas chemical-bonds typically store energies less than 1e4 J/g. Energy density is only a necessary condition for usefulness as an energetic material. Detailed here is the final report of a search for novel mechanisms for the rapid and controllable-release of nuclear energy within radioisotopes. In particular, the focus of this work was to theoretically, numerically, and experimentally quantify the cross-sections or nuclear reactions induced by heavy ions or energetic neutrons. Radioisotopes were studied which are energy-rich (1e9 J/g) and are more abundant or naturally occurring with half-lives up to billions of years. The nuclear reaction cross sections were quantified by changes in the normal radioactive decay rate ("bum-up") or measuring the presence of a disturbed secular equilibrium ("enhanced secondary decay").

DTRIAC Collection Additions *(continued)*

DTRA Technical Note

DTRA-TN-12-005, Sporicidal Efficacy of Two Disinfectants on Carrier Surfaces Contaminated with Bacillus atrophaeus Spores

This study employed a three-step method (TSM) to test the sporicidal efficacy of two disinfectants on ceramic carrier surfaces contaminated with Bacillus atrophaeus. EcaFlo and EcaSol were used as the disinfectanct and test articles. Microbiology-grade water was used as a negative control, and pH-amended bleach (pH 7 ± 0.1) was used as the positive control. Acid resistance and microscopic analysis tests were performed to qualify the spore suspension. The carriers were inoculated with the test spores using a spore suspension. The carriers were then dired overnight (at room temperature for at least 12 h). The exposure time for the TSM was 30 min. The carriers went through three different steps to recover any spores. At the same time, one clean carrier also was tested using TSM for a comparison.

DTRA Technical Document

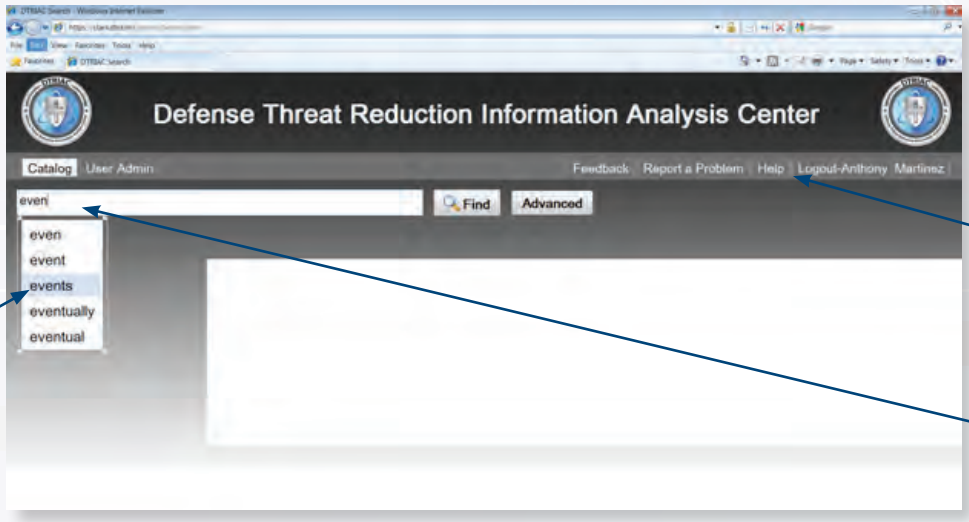
DTRA-TD-12-002, DTRA J9CXT Test Events of 2012

This document summarizes the DTRA test events conducted during the calendar year 2012. The Research and Development Directorate, Counter Weapons of Mass Destruction Technologies, Test Support Division on Kirtland Air Force Base, New Mexico, managed these events. CXT conducts testing at a variety of locations, carries out tests on multiple structures, and provides test teams for test planning, management, design and construction, predictions, instrumentation, execution, and documentation. Supported Department of Defense programs include counterterrorism, hard target defeat, and advanced concept technology demonstration. In addition, operational evaluations of new or improved weapon systems are conducted for the military services. Additional testing areas include weapon effects, blast mitigation and force protection, structure survivability, experimentation, phenomenology, and chemical/biological agent defeat.

Ask the IAC

How Do I Search On NextGen STARS?

Welcome to NextGen STARS! This article includes tips to help you conduct searches on this new system. The NextGen STARS search function provides a "Google-like" search capability based on Apache's Solr Lucene™ search-and-index engine that greatly improves the ability to find the information of interest. The search query is applied to both the catalog record of a media record (document, film, event, still, etc.) and the full text of the media record.



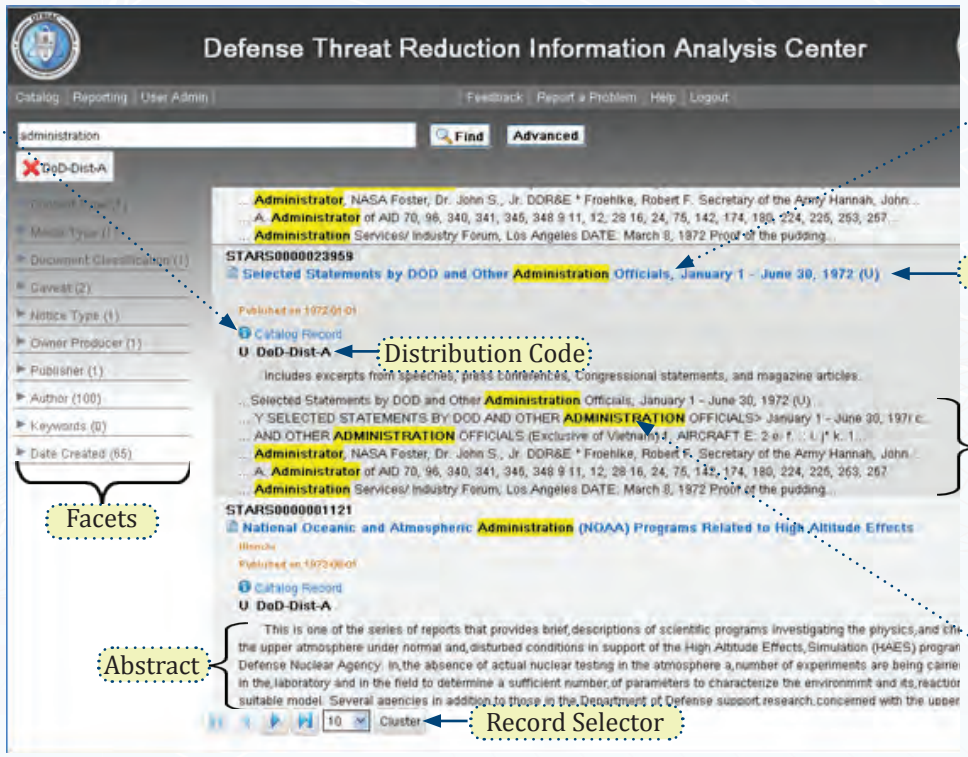
Ask the IAC *(continued)*

Search Results Page

The search results page has three main features: (1) facets on the left, which are standard categories provided for easy refinement of the current search results set; (2) the records that meet the search criteria in the main screen; and (3) a record selector at the bottom of the page that allows you to move through the pages of your search result and also to select the number of results per page.

In the main screen, click on the record Title to open the record. Click on the Catalog Record link to open the catalog record (the blue color denotes a link.)

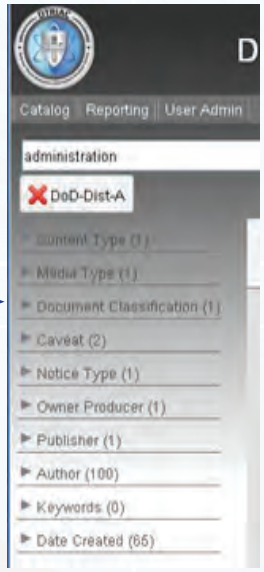
The record's abstract or description is shown under the record's distribution code. Under the abstract, sections of text that include the search terms, called snippets, are provided to allow the user to better understand the record contents and relevance.



Facets

When search results are shown, facets are provided in the left column as an easy way to further refine your search by selecting a media type, author, date created, etc. This additional filter is applied directly to your search result set while maintaining your initial search filter. You can filter your search by clicking on one or more of the facets. When you click on the facet, it appears under the search field and results including the filter are immediately returned. Clicking on the Red X in the filter box will remove the filter and reset the search results.

All of the special query operators from the old STARS system are available as well as new ones. The special query operators are detailed below. You can type these operators right into the main search field. Advanced Search functions are described in section 3.0.



Ask the IAC *(continued)*

Terms

A query is broken up into terms and operators. There are two types of terms: single terms and phrases:

- A single term is a single word such as **test** or **hello**
- A phrase is a group of words surrounded by double quotes such as **"hello dolly"**

Multiple terms can be combined together with Boolean operators to form a more complex query (see subsections 1.9 through 1.16).

FieldsTerms

Lucene supports fielded data. When performing a search, you can either specify a field or use the default field. The field names and default field are implementation specific.

You can search any field by typing the field name followed by a colon (:) and then the term you are looking for.

As an example, let's assume a Lucene index contains two fields, title and text, and text is the default field. If you want to find the document entitled "The Right Way" which contains the text "don't go this way", you can enter:

title:"The Right Way" AND text: go - or - title:"Do it right" AND right

Since text is the default field, the field indicator is not required. *Note: The field is only valid for the term that it directly precedes, so the query* title:"Do it right" AND right will only find "Do" in the title field. It will find "it" and "right" in the default field (in this case the text field).

Wildcard Searches

Lucene supports single and multiple character wildcard searches within single terms (not within phrase queries):

- To perform a single character wildcard search, use the ? symbol
- To perform a multiple character wildcard search, use the * symbol

The single character wildcard search looks for terms that match the given term with the single character replaced. For example, to search for "text" or "test" you can use the search: te?t.

Multiple character wildcard searches look for 0 or more characters. For example, to search for test, tests, or tester, you can use the search: test*. You can also use the wildcard searches in the middle of a term. *Note: You cannot use a * or ? symbol as the first character of a search.*

Fuzzy Searches

Lucene supports fuzzy searches based on the Levenshtein distance, or edit-distance algorithm. To perform a fuzzy search, use the tilde ~ symbol at the end of a single-word term. For example, to search for a term similar in spelling to "roam" use the fuzzy search: roam~ This search will find terms like foam and roams.

Starting with Lucene 1.9, an additional (optional) parameter can be added to specify the required similarity. The parameter can be a value between 0 and 1; for a value closer to 1, only terms with a higher similarity will be matched. For example: roam~0.8. If the parameter is not specified, the default that is used is 0.5.

Proximity Searches

Lucene supports finding words that are within a specified distance away from one another in a document. To do a proximity search, use the tilde~ symbol at the end of a phrase. For example, to search for "apache" and "jakarta" within 10 words of each other in a document, use the search: "jakarta apache"~10.

Range Searches

Range queries allow a user to match documents whose field values are between the lower and upper bound specified by the range query. Range queries can be inclusive or exclusive of the upper and lower bounds; inclusive range queries are denoted by square brackets, exclusive range queries are denoted by curly brackets.

Sorting is done lexicographically. mod_date:[20020101 TO 20030101]. This query will find documents whose mod_date fields have values between 20020101 and 20030101, inclusive. Note that range queries are not reserved for date fields. You could also use range queries with nondate fields: title: Aida TO Carmen}. This will find all documents whose titles are between Aida and Carmen, but not including Aida and Carmen.

Ask the IAC *(continued)*

Boolean Operators

Boolean operators allow terms to be combined through logic operators. Lucene supports AND, +, OR, NOT, and - as Boolean operators (Boolean operators must be ALL CAPS).

The OR operator is the default conjunction operator. This means that if there is no Boolean operator between two terms, the OR operator is used. The OR operator links two terms and finds a matching document if either of the terms exist in a document. This is equivalent to a union using sets. The symbol || can be used in place of the word OR.

To search for documents that contain either "jakarta apache" or just "jakarta" use the query: "jakarta apache" jakarta -or- "jakarta apache" OR jakarta.

AND

The AND operator matches documents where both terms exist anywhere in the text of a single document. This is equivalent to an intersection using sets. The symbol && can be used in place of the word AND. To search for documents that contain "jakarta apache" and "Apache Lucene" use the query: "jakarta apache" AND "Apache Lucene".

+

The + (or required) operator requires that the term after the + symbol exist somewhere in the field of a single document. To search for documents that must contain "jakarta" and may contain "lucene" use the query: +jakarta lucene.

NOT

The NOT operator excludes documents that contain the term after NOT. This is equivalent to a difference using sets. The symbol ! can be used in place of the word NOT. To search for documents that contain "jakarta apache" but not "Apache Lucene" use the query: "jakarta apache" NOT "Apache Lucene". The NOT operator cannot be used with just one term. For example, the following search will return no results: NOT "jakarta apache".

-

The – (or prohibit) operator excludes documents that contain the term after the - symbol. To search for documents that contain "jakarta apache" but not "Apache Lucene" use the query: "jakarta apache" -"Apache Lucene".

Grouping

Lucene supports using parentheses to group clauses to form subqueries. This can be very useful for controlling the Boolean logic for a query. To search for either "jakarta" or "apache" and "website" use the query: (jakarta OR apache) AND website. This eliminates any confusion, making sure that website must exist and either term jakarta or apache may exist.

Field Grouping

Lucene supports using parentheses to group multiple clauses to search a single field. To search for a title that contains both the word "return" and the phrase "pink panther" use the query: title:(+return +"pink panther").

Escaping Special Characters

Lucene supports escaping special characters that are part of the query syntax. The current list of special characters is: + - && || ! ( ) { } [ ] ^ " ~ * ? : \. To escape these characters, use the \ symbol before the character. For example, to search for (1+1):2 use the query: \(1\+1\)\:2.

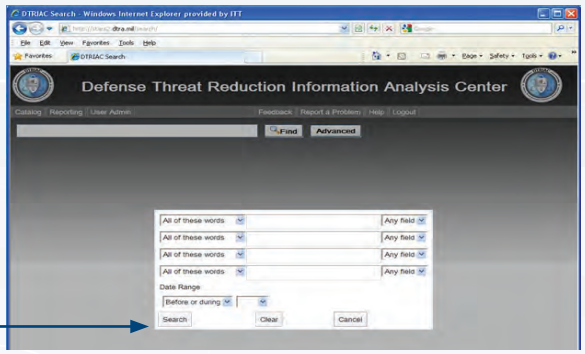
Foam Tree

A new feature in NextGen STARS is the heat map created by the Foam Tree plug-in that provides a visual depiction of the contents of the entire collection and of your search results. A heat map is “a graphical representation of data where the individual values contained in a matrix are represented as colors.”

Ask the IAC *(continued)*

Advanced Search

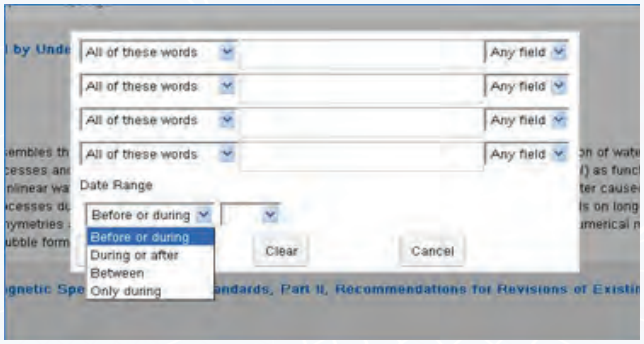
Advanced search can be accessed in the search window, next to the Find button by clicking Advanced. The user can enter terms or phrases into four fields to further narrow or filter the search. Once the user gets familiar with the operators in the main search feature, they won't need to use advanced search anymore. In the meantime, advanced search criteria can be applied towards Any field, Title, Author, or you can use this panel or just type the query you want right into the search bar: "title: danny AND author: smith AND text: -nuclear".



The filters entered in the four fields have the operator AND added between them and are defined in table below.

Query criteria	How it filters the query	Examples
Any of these words	This filter takes one or more words and searches for each one with an OR operator between the words. At least one of the specified words must be found.	Entering Danny Boy Test will result in all titles, abstracts, or full text that include Danny OR Boy OR Test.
Exact phrase	This filter is the same as applying quotes to search for an exact word or set of words in a specific order, without normal improvements such as spelling corrections and synonyms. This option is handy when searching for a very specific phrase. Tip: Only use this filter if you're looking for a very precise word or phrase, because otherwise you could be excluding helpful results by mistake.	Entering Danny Boy will result in all titles, abstracts, or full text that include the words Danny Boy in this specific order.
All of these words	This filter takes one or more words and searches for each one with an AND operator between the words. Each word must be present in the title, abstract, or full text to qualify for this filter.	Entering Danny Boy Test will result in all titles, abstracts, or full text that include Danny AND Boy AND Test.
None of these words	Add a hyphen - before a word to exclude all results that include that word. This is especially useful for synonyms like Jaguar the car brand and jaguar the animal. Tip: You must place the hyphen against the word you intend to exclude, with no space in-between.	Entering jaguar speed -car would help narrow your search to the Jaguar animal or football group.

In addition, users can search on a Date Range for the year the media record was created or authored:



If you have any additional questions about searching NextGen STARS, you can contact NextGen STARS customer support at (505) 853-0854 or via e-mail at DTRIAC@dtra.mil .

This Quarter in History

March 2, 1941 Glenn Seaborg, Edwin McMillan, Joseph Kennedy, and Arthur Wahl isolate the first measurable qualities of element 94. The team suggested naming the element "plutonium" after the planet Pluto, following the convention of the two previous elements "uranium" and "neptunium."

February 2, 1950 Klaus Fuchs is arrested. Just days earlier, he had confessed to having been a spy for the USSR and to passing on top-secret nuclear information from his involvement on the Manhattan Project and the development of the hydrogen bomb. After serving a 9-year prison sentence, he immigrated to East Germany and continued his physics work.

January 21, 1954 The USS Nautilus, the world's first nuclear submarine, is launched. The nuclear fuel system allowed the Nautilus to remain submerged for four months at a time. Current nuclear submarines never have to be refueled during their 25-year life spans.